PRODUCT DATA

Sound Level Meter Calibration System Type 3630-A for Calibration Platform Type 3630

The calibration of sound level meters is heavily driven by legislative requirements. As the number of instruments requiring calibration increases, so the need for an efficient calibration system becomes more and more obvious.

The Sound Level Meter (SLM) Calibration system for Type 3630 complies with all relevant international standards and recommendations and is equally well suited for use in national calibration laboratories and commercial calibration centres. The system combines state-of-the-art IT with Brüel & Kjær's proven experience in the calibration of instrumentation for sound and vibration measurement.

The Type 3630-A SLM calibration system is not just an effective tool. The fact that the system is globally supported, easy to recalibrate and, not least, comes with a comprehensive user manual (that even includes the uncertainty budgets needed for accreditation purposes), means that customers get an impressive package for their investment.

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USES AND FEATURES

USES

- Acoustical and electrical calibration of sound level meters to international standards

FEATURES

- Automatic, semi-automatic or manual calibration of sound level meters
- Runs under Microsoft® Windows®
- Flexible test-execution manager
- Integrated Calibration Manager's Workbench with:
  – traceability control
  – customer database
- Predefined or user-defined calibration sequences
- Transparent user interface
- Test signals comply with IEC 60651 and IEC 60804
- IEC 61672 tests available as an upgrade
- Default acceptance limits set in accordance with IEC-type Sound Level Meters
- User-adaptable acceptance limits (OIML requirements)
- Taktmaximal Tests (DIN 45657)
- External electrical traceability via system's digital voltmeter
- External acoustic traceability via Multifunction Acoustic Calibrator Type 4226
- Built-in system verification of measurement quality
- Flexible Certificate of Calibration with detailed test report
- Fully integrated in the Microsoft® Office environment

Brüel & Kjær

System Concept

The new generation of calibration systems from Brüel & Kjær uses the Portable PULSE™ analyzer as the core system element. Portable PULSE is a state-of-the-art, highly flexible multi-analyzer capable of analysing by FFT, 1/n-octave filters and overall levels. PULSE also generates the test signals necessary to fulfill the requirements of international standards.

The Sound Level Meter Calibration system for the Type 3630 platform is designed to calibrate Brüel & Kjær as well as other manufacturers' sound level meters, according to IEC 60651, IEC 60804 and relevant ANSI standards. Future upgrades will cover the coming IEC 61672 standard.

Integrated Applications

Previously, different applications would typically run on dedicated, stand-alone systems. However, all applications on the new platform are fully integrated. This means that information entered just once, for example, customer information, is available to all applications which guarantees data integrity and saves you time. Furthermore, the system's integration with the Microsoft® Office environment assures data compatibility facilitating data export for analysis.

Calibration Manager's Workbench

Proof of traceability and control over calibration intervals for the standards and instruments used by the system is facilitated by the Calibration Manager.

Tests Performed by the Type 3630-A System

Acoustical:

- Absolute Acoustical Sensitivity Level
- Frequency Response Measured in Acoustic Coupler (A, B, C, Lin)

Electrical:

- Determining Electrical Level for L_{ref} @ 1 kHz
- Electrical Inherent Noise Level (A, B, C, Lin)
- Frequency Response (A, B, C, Lin)
- Linearity Range (SPL, L_{eq} and SEL)
- Level Range Control
- Time Weighting
  - Difference in Reference Level Indication
  - Response to Single Burst (Fast, Slow, Impulse)
  - Response to a Continuous Sequence of Bursts (Impulse)
  - Peak
- RMS Detector (Crest factor 3, 5 and 10)
  - Sine Bursts
  - Rectangular Pulses
- Overload Indication
  - Sine Signals, Inverse A
  - 4 kHz Tone burst
- Time averaging
- Pulse Range
- Average AI-weighted SPL

Test Modes
Tests are performed either acoustically or electrically. During the electrical tests, the SLM's microphone is replaced by an adaptor with the same capacitance as the microphone. The adaptor is connected to the system output. The PULSE generator produces all the electrical test signals used during the calibration.

Automatic Mode
If the SLM under test has a bus interface, then setup and reading of data from the SLM is performed via the bus. The complete test is controlled by the Windows® software.

Semi-automatic Mode
If the SLM has a DC output, then this is connected to the system's digital voltmeter through the multiplexer. The relationship between the SLM's display and the DC output is tested. If a satisfactory relationship is established, the SLM display can be calculated by the reading from the system's digital voltmeter. Hence, the calibration becomes semi-automatic and time-saving.

Manual Mode
If the SLM does not have a DC output, or a satisfactory corelation between the display reading and the DC output, then the calibration can continue but all results must be entered manually via the computer's keyboard.

Acoustic Tests
Acoustic tests are performed using Multifunction Acoustic Calibrator Type 4226. The use of Type 4226 requires knowledge of the "Type 4226 corrections". This information is available for all relevant types of Brüel & Kjær microphones and is contained in the technical documentation that accompanies all microphone packages.

User Interface
An advanced test execution manager controls the calibration sequence and test modes. The user interface has separate windows for operator instructions, test results, system setup and even a log file with the complete calibration history for each session, see Fig. 1.

The size and position of the windows can be adapted to individual requirements and the settings saved.

System Architecture and Security
All system communication is via a LAN while a sophisticated, multi-level, user-access security system controls user rights and data protection.

Flexibility
By default, the acceptance limits are set to equal the limits given in the IEC standards for the actual type of SLM (0, 1, 2 or 3). However, in order to provide maximum flexibility, you can correct the acceptance level either globally or for each individual test[1].

Reporting
When calibration of the SLM is finished, all data are stored and a "Certificate of Calibration" can be printed out either directly after the calibration or later from another computer on the network. Once a certificate has been generated, the relevant calibration data are locked to protect the data and to ensure that the printed certificates can always be exactly reproduced.

1. For in-field testing, OIML R 58 allows you to add 25% to IEC tolerances. This criterion is easily met by the flexible limits.

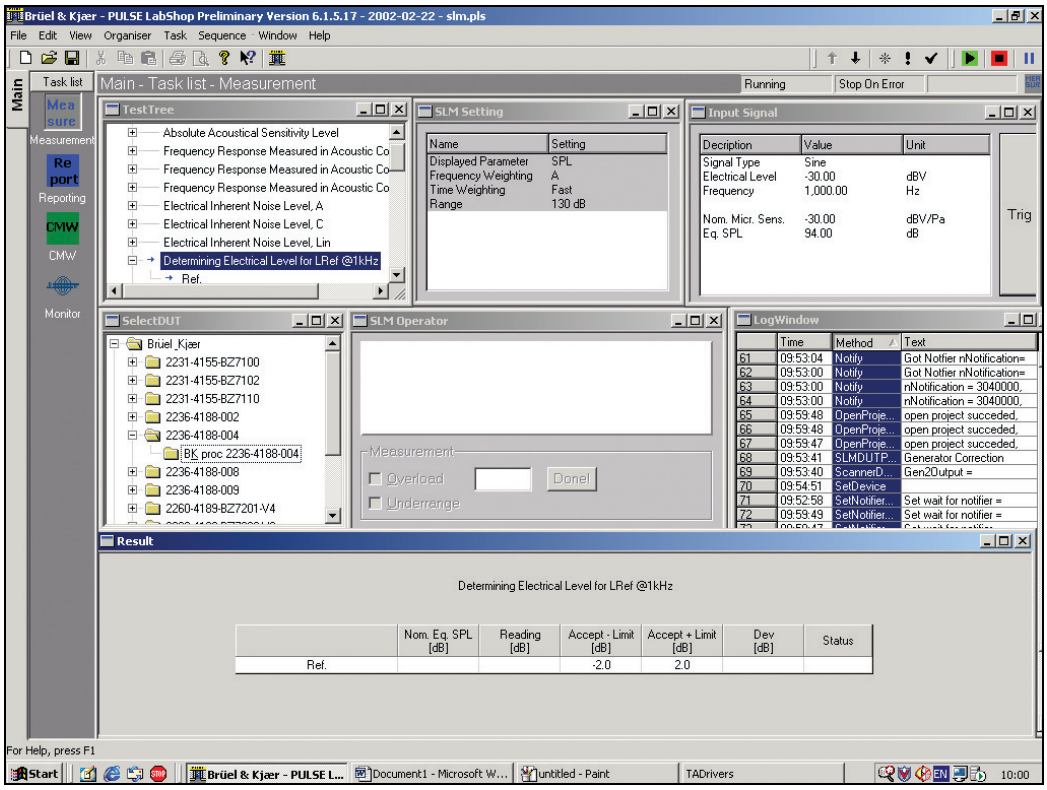


Fig. 1
User interface of SLM Calibration System Type 3630-A

The system supports a number of predefined and user-definable certificates. Accordingly, individual logos and different languages are fully supported by the SLM calibration system.

Options

The following options are available with the Type 3630-A System:

- On-site installation and training
- Tool to add new SLM types
- Maintenance contracts (hardware and software)

Watch Out for Other Members of the Family!

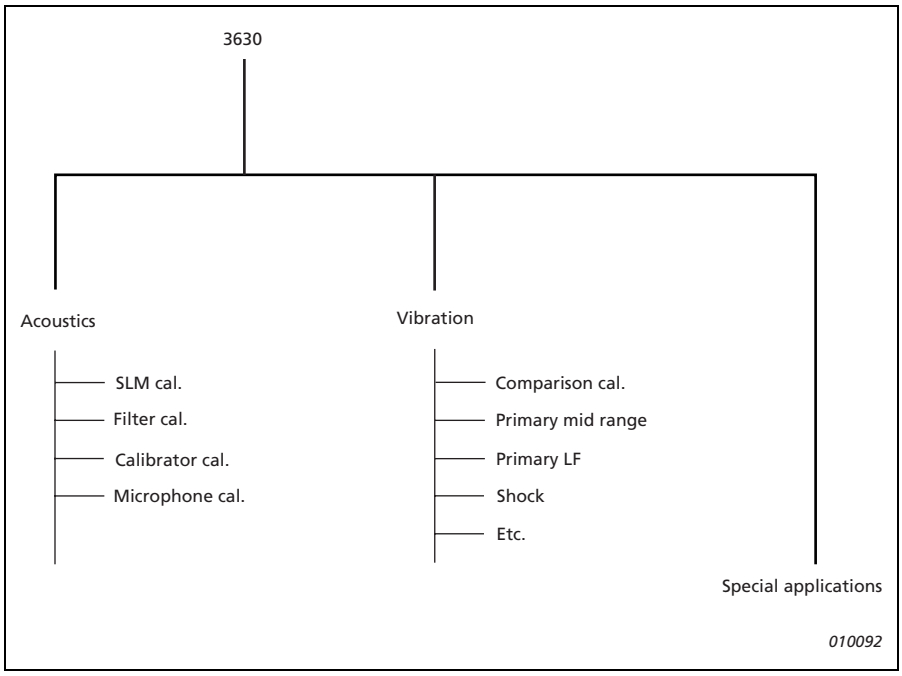
Type 3630-A is far more than just a single-purpose calibration system – it is part of an entire calibration platform.

This platform is based upon a highly modular hardware/software concept which, hand in hand with the PULSE multi-analyzer, offers a multitude of different calibration applications. The platform's modularity gives maximum measurement flexibility because a multifunctional system can be split into separate systems as workload or organisational requirements change.

Even customised applications such as hydrophone phase calibration or microphone high-pressure calibration can be easily implemented with the Type 3630 platform.

Fig. 2 shows the different calibration areas covered by the platform.

Fig. 2
Type 3630 platform calibration areas



Ordering Information – Type 3630-A Sound Level Meter Calibration System

Consisting of:

Type 3560-C-T00	PULSE Sound and Vibration Analyzer (2 In)
7202-B-GB	Dell™ Standard Tower PC
UL-0217	Dell 19″ flat panel display
UL-0207-GB	Microsoft® Office XP Professional Edition
Type 2978	DMM Agilent® 34970 (digital voltmeter)
2978-CAI	Accredited Initial Calibration of Type 2978
Type 3111	Output Module
Type 7763	SLM Calibration Software
Type 7762	Define New SLM Type and Procedure for Type 3630
WA-0302-A	Half-inch Input Adaptor 12 pF
WA-0302-B	Half-inch Input Adaptor 15 pF
WA-0302-C	Half-inch Input Adaptor 18 pF
WA-0302-D	Half-inch Input Adaptor 20 pF
WA-0267	Input Adaptor, Half-inch
Type 4226	Multifunction Acoustic Calibrator
4226-CAI	Accredited Initial Calibration of Type 4226
	Set of cables for system interconnection
	Complete System Manual including Uncertainty Budgets

OPTIONS

4226-CAF	Accredited Recalibration of Type 4226
2978-CAF	Accredited Recalibration of Type 2978
BK-0058	System installation, per day (Excl. travel and accomodation)
BK-0060	On-site training, per day (Excl. travel and accomodation)
M1-7700-N2	Annual Software Maintenance and Support Agreement for PULSE FFT and CPB Analysis

Technical Specifications for Tests Performed by Type 3630-A

Acoustical

ABSOLUTE ACOUSTICAL SENSITIVITY LEVEL
Calibration Uncertainty: 0.17 dB

FREQUENCY RESPONSE MEASURED WITH BRÜEL & KJÆR MULTI-FUNCTION ACOUSTIC CALIBRATOR TYPE 4226 (A, B, C, Lin)
Calibration Uncertainty: 0.2 dB to 0.6 dB (depending on the frequency and the uncertainty of microphone correction values used)
Test Frequencies: Octave frequencies from 31 Hz to 12 kHz

Electrical

DETERMINING ELECTRICAL LEVEL FOR L_{ref} @1 kHZ
Calibration Uncertainty: 0.09 dB

ELECTRICAL INHERENT NOISE LEVEL (A, B, C, Lin)
Calibration Uncertainty: 1 dB

FREQUENCY RESPONSE (A, B, C, Lin)
Calibration Uncertainty: 0.12 dB

LINEARITY RANGE (SPL, L_{eq} AND SEL)
SPL (in 1 and/or 10 dB steps):
- **Test Frequency:** One or more of 20 Hz, 31.5 Hz, 1 kHz, 4 kHz, 8 kHz, 12.5 kHz
- **Calibration Uncertainty:** 0.13 – 0.24 dB

L_{eq}:
- **Test Frequency:** 4 kHz
- **Calibration Uncertainty:** 0.13 – 0.24 dB

SEL:
- **Test Frequency:** 1 second single Sine Burst at 4 kHz
- **Calibration Uncertainty:** 0.13 – 0.24 dB

LEVEL RANGE CONTROL
Calibration Uncertainty: 0.12 dB
Test Frequency: One or more of 20 Hz, 31.5 Hz, 1 kHz, 4 kHz, 8 kHz, 12.5 kHz

TIME WEIGHTING
Difference in Reference Level Indication
Calibration Uncertainty: 0.11 dB
Test Frequency: 1 kHz
Response to Single Burst (Fast, Slow, Impulse)
Calibration Uncertainty: 0.12 – 0.23 dB
Response to single burst tested for various burst durations in F, S and I:
- Burst signal: 2 kHz sine
- Burst Duration: Fast 200 ms, Slow 500 ms, and Impulse 20 ms, 5 ms and 2 ms
- Signal level: 10 dB steps

Response to a Continuous Sequence of Bursts (Impulse)
Calibration Uncertainty: 0.1 dB
- Burst signal: 2 kHz sine
- Burst Duration: 5 ms
- Repetition frequency: 100 Hz, 20 Hz and 2 Hz
- Signal level: 10 dB steps

Peak
Calibration Uncertainty: 0.1 dB
- Positive and negative single square pulse:
- Pulse Duration: 10 ms and 100 μs

RMS DETECTOR (CREST FACTOR 3, 5 AND 10)
Sine Bursts
Calibration Uncertainty: 0.16 dB
- Burst signal: 2 kHz sine
- Burst Duration: 0.5 ms, 2 ms and 5.5 ms
- Repetition frequency: 40 Hz
- Signal level: 10 dB steps

Rectangular Pulses
Calibration Uncertainty: 0.2 dB
- Pulse Duration: 200 μs
- Signal level: 10 dB steps

OVERLOAD INDICATION
Inverse A-weighted
Freq: 1/3-octave frequencies from 1 kHz and downwards until overload occurs
4 kHz Tone burst
Calibration Uncertainty: 0.31 dB
- Burst signal: 4 kHz sine
- Burst Duration: 1 ms

TIME AVERAGING
Calibration Uncertainty: 0.16 dB
- Burst signal: 4 kHz sine
- Burst Duration: 1 ms
- Repetition time: 10 ms, 100 ms, 1 s, 10 s

PULSE RANGE
Calibration Uncertainty: 0.2 dB
Test of response to a single 4 kHz tone-burst superimposed on a low-level continuous sine signal:
Burst Duration: 4, 40, 400 and 4000 periods
Peak Level: 53, 63 and 73 dB above the low-level signal

AVERAGE AI-WEIGHTED SPL
Calibration Uncertainty: 0.12 dB
- Burst signal: 4 kHz sine
- Burst Duration: 1 s, 20 ms, 5 ms, 1 ms
- Repetition time: 5 ms

SYSTEM CALIBRATION
Electrical uncertainty achieved after weekly electrical self-calibration typically better than 0.05 dB

GENERAL
All tests are performed to international standards (IEC 60651 and IEC 60804) with acceptance limits as defined in the standards
For each single test, the acceptance limit can be modified by a user-selected factor (e.g., 125 will add 25% to the IEC tolerance as defined in OIML R 58 for service verification)
The stated calibration uncertainties are Best Measuring Capabilities – 12-month specifications expressed as combined expanded uncertainty with a coverage factor $k = 2$
The uncertainties are valid at 23° ± 3°C and RH 50% ± 25% RH
The uncertainties stated include a quantization error for an instrument with 0.1 dB resolution
Mechanical Dimensions (depth × height × width):
500 × 433 × 520 mm (19.7 × 17.0 × 20.5″)
Weight: approx. 50 kg
Mains Voltage Range: 110 V to 240 V/50 to 60 Hz

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